

Motorola[®] HOME Radio

SERVICE MANUAL

MODELS
5M1
5M1U
5M2
5M2U

CHASSIS
HS-223
HS-249

GENERAL INFORMATION

TYPE - Three-power (AC/DC, Battery) portable radio receiver. Four miniature type tubes and a selenium rectifier are used in a superheterodyne circuit.

MODEL	COLOR	CHASSIS
5M1	Green	HS-249
5M1U	Green	HS-223
5M2	Maroon	HS-249
5M2U	Maroon	HS-223

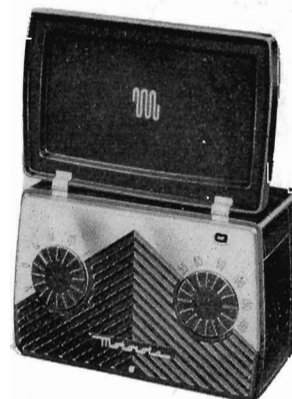
TUNING RANGE - 535 to 1620 Kc IF - 455 Kc

TUBE COMPLEMENT - 1R5 - Converter
 1R4 - IF Amplifier
 1U5 - Det, AVC & 1st AF Amp
 3S4 - Power Amplifier
 Rectifier - Selenium type - for
 AC/DC operation

POWER SUPPLY - Operates from 117V AC/DC (15 watts)
 or from the following batteries:

2 - $1\frac{1}{2}$ V flashlight cells (Eveready #950 or equivalent)

1 - 67 $\frac{1}{2}$ V "B" battery (Eveready #467 or equivalent)



5M1 & 5M2
 SERIES

OPERATING INSTRUCTIONS

TO OPEN FRONT COVER. The front cover is opened by pushing upward on the "M" bar located in the center of the cover. The receiver is automatically turned on when the front cover is opened and raised to a vertical position.

TO OPEN BACK COVER. The back cover may be opened by gently pulling it at the top. When closing the cover, be careful not to pinch the power line cord or other leads between the cover and the cabinet.

117 VOLT AC OR DC OPERATION. The power cord is located inside the cabinet and may be reached by opening the back cover. Pass the line cord through the slot on the side of the receiver, and plug it into any 117 volt AC or DC power outlet. If the receiver does not operate from DC power, reverse the plug in the power outlet. When operating from AC power, reception may sometimes be improved by reversing the power plug in the outlet. It is not necessary that batteries be installed if the receiver is to be operated only from house power lines.

BATTERY OPERATION. Open the back cover and install the batteries, following the instructions on the label inside the back cover (or see Figure 1). Insert the line cord plug into the receptacle on the chassis, or the receiver will not play from

batteries. If the receiver is to be operated for a long period of time from 117 volts AC or DC, or is to be placed in storage, remove the batteries and store them in a cool place. **IMPORTANT:** Never leave low or run-down batteries in the receiver, as they will leak or swell and damage it.

TUNING CONTROL. Stations are tuned in with the right-hand knob. The markings around the tuning knob may be read in kilocycles by adding one zero to the figures.

VOLUME CONTROL. The left-hand knob controls volume.

TO TURN OFF. Closing the front cover will automatically turn off the receiver.

ANTENNA. A loop antenna is built into the front cover. Because of the slightly directional characteristics of the loop antenna, reception from some stations may be improved by rotating the entire receiver. In extremely noisy locations, rotate the receiver until minimum noise and maximum signal pickup are obtained.

BATTERY REPLACEMENT. If low volume or fuzzy tone is noticed when operating from batteries, replace the flashlight cells. Normally, the 67 $\frac{1}{2}$ V "B" bat-

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tery will last for 3 or 4 changes of the flashlight cells. The condition of the batteries will not affect the operation of the receiver from 117 volts

AC or DC. Complete battery replacement instructions will be found inside the cabinet back cover (or See Figure 1).

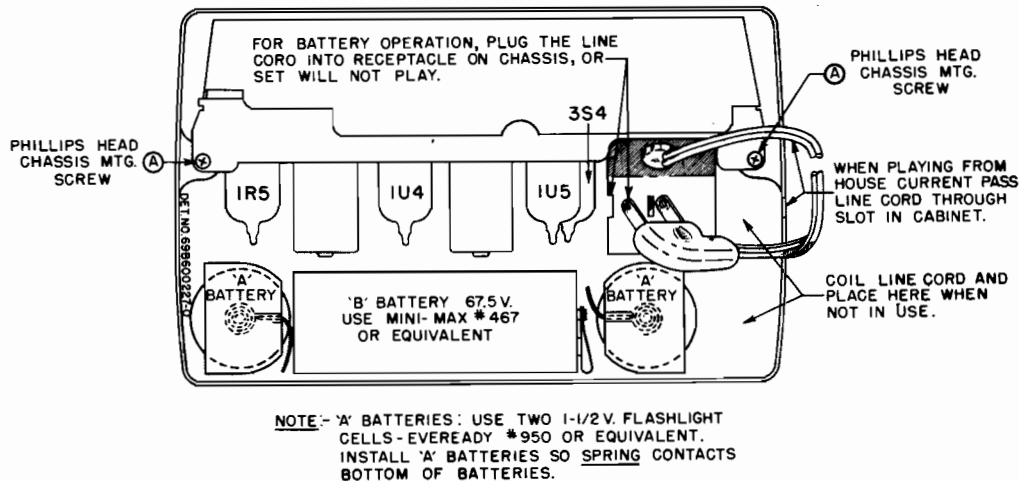


FIGURE 1. BATTERY INSTALLATION & CHASSIS REMOVAL INSTRUCTIONS

ALIGNMENT

NOTE: The receiver may be operated either from a battery or from the commercial power lines during alignment. If AC power is used, it is recommended that an isolation transformer be placed between the power line and the receiver. If an isolation transformer is not available, connect the low side of the signal generator to B- through a .1 mf capacitor.

1. Connect a low range output meter across the speaker voice coil.
2. Connect the low side of the signal generator to B-.
3. Set the signal generator for 400 cycle, 30%

modulation.

4. Turn the receiver volume control to maximum.
5. Use a small fibre screwdriver for aligning the IF and diode transformers.
6. As stages are brought into alignment, reduce the signal generator input to keep the output of the receiver at approximately .05 watt (.05 watt = .40 volts on the output meter) to avoid overloading the receiver.
7. See Figure 2 for adjustment locations and the following chart for procedure.

ALIGNMENT CHART

STEP	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT						
1.	.1 mf	Grid of conv (pin 6, 1R5)*	455 Kc	Fully open	1, 2 & 3	Adjust for maximum.
RF ALIGNMENT						
2.	-	Grid of conv (pin 6, 1R5)*	1620 Kc	Fully open	4	Adjust for maximum.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	-	Radiation loop**	1400 Kc	Tune for maximum	5	Adjust for maximum. Trimmer is reached through hole under plug button on side of cabinet.

* On chassis HS-249 return the grid of the converter tube to AVC either through the loop or through a 4.7 meg resistor (as in chassis HS-223).

**Connect generator output across 5" diameter, 5 turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

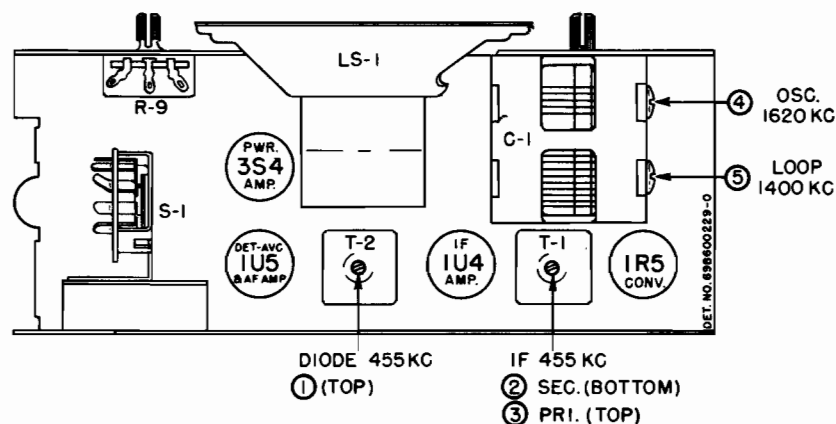


FIGURE 2. TUBE & TRIMMER LOCATIONS

SERVICE NOTES

The chassis of this receiver is isolated from the AC power line circuit by a capacitor-choke assembly to eliminate the shock hazard when handling the receiver. However, as an additional precaution when aligning or servicing the receiver from AC, an isolation transformer should be inserted between the power line and the chassis.

The tubes are exposed when the rear cover is opened. It is not necessary to remove the chassis to replace tubes.

To remove the chassis from the cabinet:

1. Pull off the two control knobs on the front of the cabinet.
2. Open the rear cover and remove the batteries.
3. Remove the two Phillips head screws holding the chassis to the cabinet ("A" - "A" in Figure 1).
4. Slide the chassis out of the cabinet.
5. Disconnect the two leads from the chassis to the loop antenna hinges.

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	LIST PRICE
CHASSIS PARTS - ELECTRICAL			
CAPACITORS			
C-1	19K692007	Variable, 2-gang	2.50
C-2	21K481377	Ceramic: 500 mmf 500V .....	.20
C-3	21K482726	Ceramic, disc type: 10,000 mmf 450V .....	.30
C-4	21K482726	Ceramic, disc type: 10,000 mmf 450V .....	.30
C-5	21K77373	Ceramic: 47 mmf 500V .....	.20
C-6	8K71213	Paper: .05 mf 100V .....	.20
C-7	8K71213	Paper: .05 mf 100V .....	.20
C-8	8K471635	Paper: .05 mf 400V .....	.20
C-9	23B691995	Electrolytic: 40-40 mf 150V/250 mf 10V	1.75
C-10A, B, C, D	21K691992	Ceramic, multiple: 2000 mmf, 100 mmf, 100 mmf, 5000 mmf ....	.65
C-11	21K482726	Ceramic, disc type: 10,000 mmf 450V .....	.30
C-12	21A470789	Ceramic, disc type: 5000 mmf 450V .....	.30
CHOKE & CAPACITOR			
E-2	24K691986	Choke & .05 mf 200V paper capacitor .....	.40
RECTIFIER			
E-1	48B791092	Selenium Rectifier: half-wave...	1.40
COILS			
L-1	1X692159	Antenna Loop & Front Cover Assembly: complete; green plastic (5M1 & 5M1U)	5.25
	1X692160	Antenna Loop, Panel & Hinge Assembly: less front cover; green plastic (5M1 & 5M1U)....	2.90
	24B692200	Antenna Loop & Panel Assembly: less hinges; green plastic (5M1 & 5M1U)	1.40
	1X600129	Antenna Loop & Front Cover Assembly: complete; maroon plastic (5M2 & 5M2U)	5.25
	1X600130	Antenna Loop, Panel & Hinge Assembly: less front cover; maroon plastic (5M2 & 5M2U)....	2.90

REF. NO.	PART NO.	DESCRIPTION	LIST PRICE
	24K600132	Antenna Loop & Panel Assembly: less hinges; maroon plastic (5M2 & 5M2U)	1.40
L-2	24K600097	Oscillator Coil (yellow code)...	.75
SPEAKER			
LS-1	50K600142	Speaker: 3½" PM; 3.2 ohm VC....	2.65
		exch	2.00
	or 50K600141	Speaker: 3½" PM; 3.2 ohm VC....	2.65
		exch	2.00
RESISTORS			
Note: All resistors are insulated, carbon type unless otherwise specified.			
R-1	6R2122	4.7 meg 20% ½W	1.00
R-2	6R6031	100,000 10% ½W	1.00
R-3	6R6397	22,000 10% ½W	1.00
R-4	6R2109	10 meg 20% ½W	1.00
R-5	6R5683	27 10% ½W	1.00
R-6	6R2118	3.3 meg 20% ½W	1.00
R-7	17K692009	Wire wound: 2150 5% 10W; tapped ..	.80
R-8	6R5581	3300 10% ½W	1.00
R-9	18A691993	Volume control: 1 megohm.....	.80
R-10	6R5554	390 10% ½W	1.00
R-11	6R2109	10 meg 20% ½W	1.00
R-12	6R6004	1 meg 20% ½W	1.00
R-13	6R2122	4.7 meg 20% ½W	1.00
R-14	6R2118	3.3 meg 20% ½W	1.00
R-15	6R6432	270 10% ½W	1.00
R-16	6R6040	680 10% ½W	1.00
R-17	6R6269	820 10% ½W	1.00
R-18	6R6015	220,000 20% ½W	1.00

SWITCHES			
S-1	40B471927	Rotary switch, 5PDT (AC/DC, battery selector).....	1.15
S-2	40A691999	Slide switch (on-off).....	.50
TRANSFORMERS			
T-1	24B692014	IF Transformer, 455 Kc: complete with capacitors, less shield...	1.05
T-2	24B692015	Diode Transformer, 455 Kc; complete with capacitors, less shield	1.05
T-3	25K692006	Output Transformer .....	.95

PART NUMBER	DESCRIPTION	LIST PRICE	PART NUMBER	DESCRIPTION	LIST PRICE
CHASSIS PARTS - MECHANICAL			42A600094	Clip, grille retainer (holds front grille to cabinet) .....doz	.30
43A692011	Bushing, insulator: fibre (on rear edge of chassis) .....doz	.40	55A692058	Cover, handle mtg: brass plated (over ends of handle) .....doz	.40
43A692012	Bushing, strain relief: line cord (use with 43K692013) .....doz	.05	13D691949	Escutcheon, dial & volume (on front of cabinet) .....doz	1.25
42K75826	Clip, electrolytic mtg .....doz	.40	55A27113	Foot, cabinet bottom: felt .....doz	.60
42A485548	Clip, IF transformer mtg .....doz	.20	1X692162	Front Cover Assembly: complete, less loop; green plastic (5M1 & 5M1U).....doz	1.90
30B691994	Cord, line: with plug; 6 ft long (HS-223 only) .....doz	.70	1X600131	Front Cover Assembly: complete, less loop; maroon plastic (5M2 & 5M2U)....doz	1.90
30K600125	Cord, line: with plug; 6 ft long (HS-249 only) .....doz	.70	1X692158	Grille Assembly: complete with escutcheon; green plastic (5M1 & 5M1U) .....doz	2.20
4S7650	Lockwasher, internal: #6; cad pl.per/c	.50	1X600128	Grille Assembly: complete with escutcheon; maroon plastic (5M2 & 5M2U) .....doz	2.20
29R5294	Lug, soldering (holds battery leads) .....per/c	.75	55K692166	Handle, carrying: green plastic; less spring (5M1 & 5M1U) .....doz	.20
29R5239	Lug, soldering: #8 hole (holds line cord) (HS-223 only) .....doz	.15	55K600107	Handle, carrying: maroon plastic; less spring (5M2 & 5M2U) .....doz	.20
29R3020	Lug, soldering: battery contact (in 'A' battery retainer) .....doz	.20	55C692202	Hinge, front cover; complete; left-hand	.65
2S7005	Nut, hex: 6-32 x 1/4 stl; cad pl (R-7 & selenium rect mtg) .....per/c	.50	55K600087	Hinge, front cover: complete; right-hand	.65
2S7051	Nut, hex: palnut; 3/8-32 x 9/16; cad pl (volume control mtg).....doz	.15	55K30198	Hinge, rear cover .....doz	.25
9A470980	Receptacle, loop (on lead to loop).doz	.25	36B691899	Knob, control: green plastic (5M1 & 5M1U) .....doz	.15
15B481896	Retainer, 'A' battery: plastic.....doz	.15	36K600105	Knob, control: maroon plastic (5M2 & 5M2U).....doz	.15
43K692013	Retainer, strain relief (on line cord bushing) (use with 43A692012).....doz	.05	1X692163	Latch and Plate Assembly (inside front cover) .....doz	.30
5S7771	Rivet: .088 x 3/16 stl; nkl pl (tube socket mtg) .....per/c	.50	4S8406	Lockwasher, internal: #2; cad pl.per/c	.50
5S7706	Rivet: .122 x 1/8 stl; nkl pl (term strip & switch mtg).....per/c	.50	4S7683	Lockwasher, internal: #4; cad pl.per/c	.50
3S490828	Screw, machine: 6-32 x 3/16; plain hex head lock screw; cad pl (gang mtg).doz	.15	29R5399	Lug, soldering (under front hinge, for loop connection) .....per/c	.50
3S7363	Screw, machine: 6-32 x 1 slotted binderhead; cad pl (selenium rect mtg).....per/c	.50	13B691901	Medallion (on front cover) .....doz	.40
3S1451	Screw, machine: 6-32 x 2 slotted round head; cad pl (R-7 mtg).....doz	.15	28A692198	Pin, loop connector (on front hinge) .....per/c	.50
3S7205	Screw, machine: 8-32 x 1/4 slotted hex head lock screw; cad pl (spkr mtg).doz	.15	64A692191	Plate, handle mtg: cad pl (under ends of handle) .....doz	.35
3S2695	Screw, sheet metal: #6 x 3/16 PKZ pl hex head; cad pl (rear shield mtg) .....per/c	.50	5S8487	Rivet: .088 x 3/32 stl; blk nkl (rear cover hinges) .....per/c	.50
3S7462	Screw, thread-cutting: 6-32 x 3/16 plain hex head; cad pl (S-1 mtg)per/c	.50	5S8490	Rivet: .088 x 5/32 stl; blk nkl (front hinge mtg)(5M1 & 5M1U)...per/c	.50
26K692003	Shield, back (on rear of chassis).....doz	.15	5S2827	Rivet: .088 x 5/32 stl; statuary bronze (front hinge mtg)(5M2 & 5M2U)...per/c	.50
26A692005	Shield, heat (around R-7) .....doz	.30	3S490849	Screw, machine: 4-40 x 11/32 Phillips round head; cad pl (mounts front hinges to cabinet).....doz	.15
26K691997	Shield, switch (over AC/DC, Batt. sw)..doz	.15	3S2995	Screw, machine: 5-40 x 5/16 plain hex head; cad pl (handle mtg).....per/c	.50
9A690129	Socket, tube: miniature; 7-prong .....doz	.20	3S490018	Screw, sheet metal: #2 x 1/4 PKZ Phillips flat head; blk nkl (mounts loop to front cover)(5M1 & 5M1U).doz	.20
41K680029	Spring, battery contact (in 'A' battery retainer) .....doz	.20	3S3389	Screw, sheet metal: #2 x 1/4 PKZ Phillips flat head; statuary bronze (mounts loop to front cover) (5M2 & 5M2U) .....doz	.20
31K470880	Strip, 'B' battery terminal; with leads	.40	3S490739	Screw, sheet metal: #4 x 1/4 PKZ Phillips binderhead; cad pl (chassis mtg) .....doz	.15
31K37504	Strip, terminal: 1 insulated lug; #1 mtg; 3/8" spacing .....doz	.05	41A470909	Spring, door latch (inside front cover) .....doz	.55
31K470746	Strip, terminal: 3 insulated lugs; #2 mtg; 3/8" spacing .....doz	.05	41K692167	Spring, handle (inside plastic handle)	.10
4K470939	Washer, fibre (R-7 mtg) .....per/c	.50	41A692069	Spring, rear cover latch .....doz	.35
CABINET PARTS			42A692189	Strap, door latch retainer (inside front cover) .....doz	.10
7A600092	Bracket, escutcheon support: cad pl (cabinet front support)(5M1U & 5M2U) .05		46A692151	Stud, latch retainer (front cover latch, on grille) .....doz	.05
38K692050	Button, plug: green finish (5M1 & 5M1U) .....doz	.10	46K690079	Stud, trimount: blk nkl (on loop panel, for operating on-off switch)(5M1 & 5M1U) .....doz	.25
38K600106	Button, plug: maroon finish (5M2 & 5M2U) .10		46K680035	Stud, trimount: statuary bronze (on loop panel, for operating on-off switch)(5M2 & 5M2U) .....doz	.25
1X692156	Cabinet: complete, less handle, grille and front cover; green finish (5M1 & 5M1U) .....doz	6.05	4S1719	Washer, flat: 3/8 x .140 x .030 stl; cad pl (handle mtg) .....per/c	.50
1X600126	Cabinet: complete, less handle, grille and front cover; maroon finish (5M2 & 5M2U)doz	6.05			

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